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ADDRESS AT ANNUAL BANQUET OF THE  
AMERICAN CHEMICAL SOCIETY<sup>1</sup>

It is a pleasure and an inspiration to be present at a gathering of so many men devoted to the advancement of the great science of chemistry. The striking growth in the numbers of your society in recent years typifies the growing interest in the science and the growing appreciation of its importance in the industrial life of the nation. Many think that the twentieth century will be preeminently the century of the chemist; that as the nineteenth century was marked mainly by the triumphs of physics—the development of steam and gas engines, of electricity as a means of power and of communication—so this century will be signalized by applications of chemistry that will once more thrust us into an entirely new world. There seems indeed to be some good ground for such an expectation. Already great things have been accomplished—as we see by a glance at our cotton industries, dye works and countless other interests that chemistry has revolutionized. But there is no feeling of having worked out the lode; the possibilities of the future seem almost infinite and all our hopes are high. We must, however, never allow ourselves to lose sight of the fact that we shall certainly fail unless we keep industry in the closest possible touch with science. The awful example, the standing warning in this respect is of course the case of England. There, a few years ago, they celebrated the fiftieth anniversary of an English chemist's epoch-making discovery of mauve, and yet the jubilee in honor of this man of science was the occasion of the funeral oration of the color industry in his own country. This deplorable result was brought about entirely by two things that are closely related—first, the failure to keep industry in close touch with science, and second, the impatience of the manufacturer and his narrowness as a self-styled “practical” man. The practical Englishman is too apt to be impatient of the slow processes of research. He wants to be compensated in hard cash and at once. The

German, on the other hand, has learned to be no less practical, but he has retained the traditions of a race of idealists plodding patiently and surely to success. Now I need hardly say to you that it is not wise for us to spend much time in bemoaning or still worse in jeering at England in this matter. Let us look to ourselves. We are not, I think, specially remarkable for *patience*, and I doubt very much whether we are doing all that can be done to keep industry and science in the closest possible touch.

But the field of *industrial* chemistry is not the only one in which the times are critical and exacting. This is equally true of the pure science itself. I hope my own predilection for physics does not mislead me into thinking that the most conspicuous development of chemistry during the past quarter of a century has been on the physical side; but in any case there can be no question that the artificial boundaries between physics and chemistry are being rapidly removed, and of course it is well to have it frequently brought home to us that all such boundaries are purely artificial. A disturbance in one field is sure sooner or later to extend to the other. In physics we have had a veritable earthquake which has shaken the whole structure to its foundations, and I understand that not a few of the chemists have been so much impressed, not so much by the actual shaking of the building as by the cries of the expectant victims, that they are beginning to run. I would exhort such people to be calm, and not be too ready to throw away conceptions (such, *e. g.*, as that of an atom), conceptions that have proved very valuable as aids to the advancement of the science in the past. It is true, of course, that the poor old atom has been a great deal battered in its history—even in the short time since the famous examinee described it as “a square block of wood first constructed by Dr. Dalton.” It has been at one time a hard inelastic sphere, again a pulsating spherical shell, at another time simply a hole in the ether, or a vortex ring, sometimes it has appeared like a member of the British House of Lords—a mere center of in-

<sup>1</sup>By Richard C. Maclaurin, Sc.D., LL.D., president of the Massachusetts Institute of Technology.

ertia—at another it has looked more like a radical, as a storehouse of energy, endowed occasionally in the higher flights of the imagination with a reasonable soul, sometimes it has taken very high ground as a point singularity in a mathematical function, and now in its weariness it has at last compromised itself by claiming to be not an atom at all, but a solar system of electrons, each of these being that simple and transparent thing—a center of strain in the ether. However, in all these guises it has never ceased to be a useful conception to the working chemist and thereby has justified its existence. All these changes serve to emphasize two matters of some importance. The first is that it is well for us men of science to realize the limitations of our knowledge and to recognize that we don't know much about an atom, or of any of those concepts which we often so loosely describe as fundamental. Tyndall rightly objected to people who professed to be too much in the secrets of providence. He certainly, however, exposed himself to attack when he launched the famous phrase that caused so much fluttering in the dovecots—the statement that he could see within an atom “the promise and the potency of all that is.” It is a legitimate flight of the scientific imagination to see anything at all in an atom; but it may be expedient for the special purposes of science not to see too much.

The other point suggested by recent experiences is that we should pay more serious attention than we usually do to the logic of science and have as clear ideas as possible as to what we are really aiming at, as to what we can reasonably expect to do and not to do. I doubt very much whether it is wise to wait in patient expectation for the years that bring, or are supposed to bring, the philosophic mind. A little artificial stimulus towards philosophy might accelerate the process. It seems to me extremely unfortunate that men of science are still so much scared by the bogey of metaphysics. What we have to be afraid of is not metaphysics but bad metaphysics, and it is difficult to accept the simple faith of many a man of science that his metaphysics is to be

preferred to any other brand merely because it is either unconscious or naïve. A little quiet thought and study should at least have the good effect of enabling us to preserve our calm when things seem to be tumbling down. It should help us to realize that a science like chemistry is above all else a work of art, and that concepts like atoms, energy and the like are not much more than pigments with which we paint our pictures. The next generation may find new pigments or mix the old ones differently. Let us hope that they will find the same artistic satisfaction in filling in the picture and that the effect will be even more beautiful than is your science of to-day.

#### THE SALARIES OF PROFESSORS AT YALE UNIVERSITY<sup>1</sup>

WE are face to face with a necessity which we must meet in order to continue to do our work properly; and that necessity is a substantial increase of the salaries of many members of the teaching force. For those who are giving full time to the work of instruction our present normal salary scale is as follows: Instructors, first year, \$1,000; second year, \$1,200; third year, \$1,400, fourth year and thereafter, \$1,600; assistant professors, first term of service, \$1,800; second term of service, \$2,500; professors, \$4,000.

It is at the very top, in the matter of salaries of professors themselves, that the inadequacy of our present rate of pay is most strongly felt. It is there that the legitimate demands of the individual and the legitimate needs of the university coincide in demanding large increases of salary.

To begin with, this is the one point in which we stand, we think, at a disadvantage as compared with our competitors. The salaries of Yale professors doing full work run all the way from \$3,500 to \$5,000; but the number who receive \$5,000, or even \$4,500, is comparatively small. Harvard, on the other hand, has a scale of professional salaries running from \$4,500 to \$5,500; and the number of professors who are there on the highest grade or have reasonable expectation of being so, is very

<sup>1</sup> From the annual report of President Hadley.